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# **PA Control Board User's manual**

## OVERVIEW

The device provides operation control and protection of the power amplifier.

Main functions:

- Displaying the output power value, SWR value and PA current consumption value;
- Temperature monitoring and smart fan control using PWM;
- Built-in digital sequencer with bypass modes support;
- Sound and led alarm;
- Protection on overheating and SWR value exceeding;
- Calibration of the built-in SWR meter using only a power meter;
- All settings are stored to non-volatile memory;
- Device configuration and firmware update using the PC software utility.

Specifications	
Parameter	Value
Maximum displayed power	5 232 W
Type of the displayed power	passing power / effective power ***
SWR displayed range	1.0 - 9.9
SWR sensor type	external (directional coupler)
Number of the sequencer events	4
Sequencer switching delay range	20 ms - 1000 ms, step 20 ms
Sequencer channel maximum load (switches to GND)	30V, 300mA
LNA power supply (max.)*	30V, 700mA
Current sensor module	ACS712-5A; ACS712-20A; ACS712-30A; BTS50085
Current measurement range	ACS712-5A : 0 – 5A ACS712-20A: 0 – 20A ACS712-30A: 0 – 30A BTS50085: 0 – 35A
Temperature sensor	DS18B20
Temperature measurement range	-55°C .. +125°C (-67°F .. +257°F)
Maximum number of the fan stages	7
Fan power voltage range *	12V DC – 30V DC
Number of the temperature warning levels	2
Number of the SWR warning levels	2
Range of the temperature protection threshold setting	30°C .. +120°C
Range of the SWR protection threshold setting	1.1 - 6.4
SWR protection response time	less than 10 ms
Silent mode activation	yes
Supply voltage **	12V DC $\pm$ 10%
Current consumption	less than 100mA

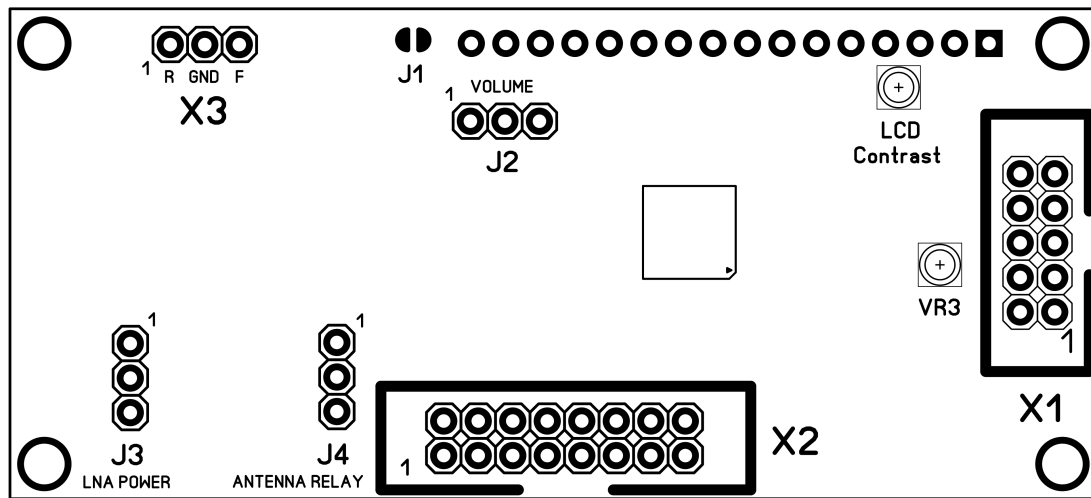
\* switching the external power source.

\*\* to avoid the device malfunction don't use the power supply with another voltage than 12V DC or use a DC-DC converter with an output voltage 12V DC.

\*\*\* effective power means power with subtraction the reflection losses from the passing power.

## MAIN UNIT

The main unit consist of main board and LCD 16x2 display. The LCD 16x2 display connects to main board via 16 pin PLS-PBS connectors couple. Boards are fixed together by a screwed spacer sleeves (TFM-M2.5X12).



Main unit connectors and jumpers

The X1 male connector (BH-10) is used to connect temperature sensor, fan, current sensor module and power supply for the device.

The X2 male connector (BH-16) is used to connect leds, control buttons, sequencer terminals, UART interface.

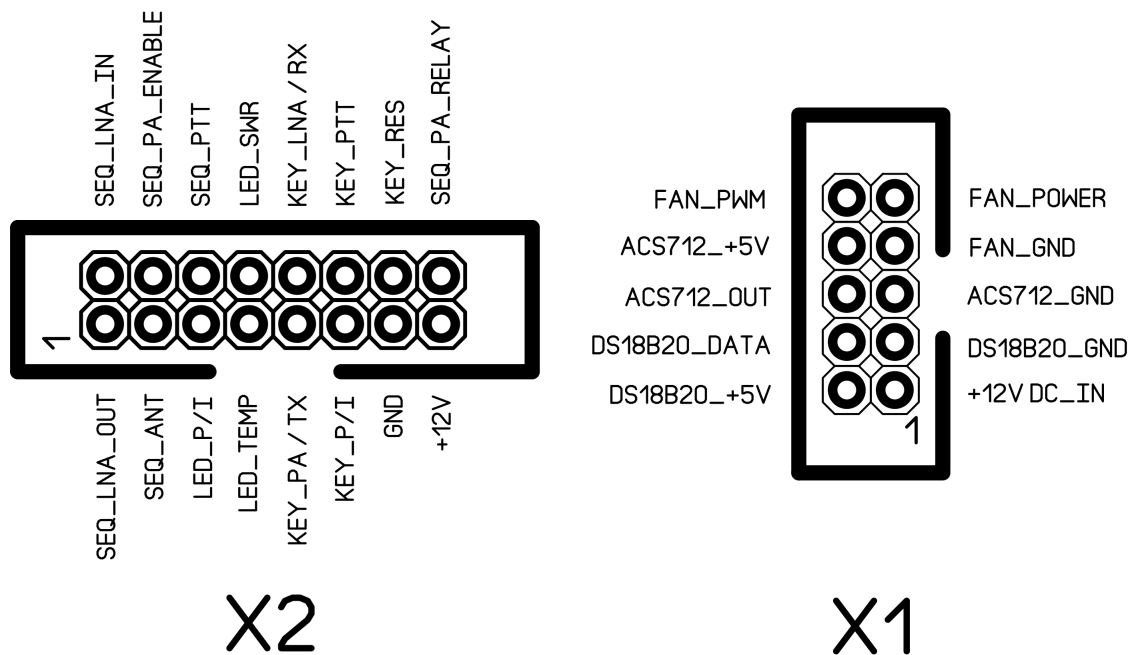
Pin connector X3 is used to connect the SWR sensor.

The J1 jumper is used to adjust an LCD backlight led current.

The J2 jumper is used to adjust the sound volume.

The J3 jumper is used to select the LNA power source.

The J4 jumper is used to select behavior of SEQ\_ANT sequencer output.


**X1 connector pin description**

Pin	Symbol	Description
1	12V DC_IN	Device power supply (+12V DC)
2	DS18B20_+5V	Temperature sensor power (Vdd)
3	DS18B20_GND	Temperature sensor GND
4	DS18B20_DATA	Temperature sensor data line (DQ)
5	ACS712_GND	Current sensor module GND
6	ACS712_OUT	Current sensor module OUT
7	FAN_GND	Fan GND
8	ACS712_+5V	Current sensor module power
9	FAN_POWER	Fan power source (connects to an external power source)
10	FAN_PWM	Fan power

**X2 connector pin description**

Pin	Symbol	Description
1	SEQ_LNA_OUT	LNA power / Antenna relay power
2	SEQ_LNA_IN	LNA power / Antenna relay power source (connects to an external power source)
3	SEQ_ANT	LNA bypass relay / Antenna relay (switches to GND by relay)
4	SEQ_PA_ENABLE	PA enable (switches to GND)
5	LED_P/I *	Led indicator of displayed value (PA output power / PA current consumption)

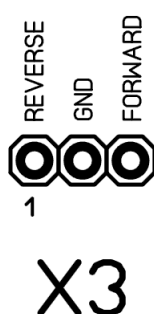
6	SEQ_PTT	Transceiver PTT-in (switches to GND)
7	LED_TEMP *	Temperature alarm led
8	LED_SWR *	SWR alarm led
9	KEY_PA ** / TX	PA key / UART transmitter output (TX)
10	KEY_LNA ** / RX	LNA key / UART receiver input (RX)
11	KEY_P/I **	P/I key
12	KEY_PTT **	PTT key, Footswitch or PC interface
13	GND	GND
14	KEY_RES **	RES key
15	+ 12V	+12V DC output
16	SEQ_PA_RELAY	PA bypass relay (switches to GND)

\* connects to the led cathode. Anode is connects to +12V DC.

\*\* keys are switch to GND.

To connect PA Control Board to PC you must use a cross-connection cable. The PA Control Board UART transmitter output (TX) must be connected to the PC UART receiver input (RX). The PA Control Board UART receiver input (RX) must be connected to the PC UART transmitter output (TX).

**WARNING.** The device has a 5V TTL level UART interface. Do not connect the PA Control Board device to PC serial port directly. Use an RS-232 converter based on MAX232 chip or use an USB-UART converter with 5V TTL level.



**X3 connector pin description**

Pin	Symbol	Description
1	REVERSE	Reverse wave output of SWR detector
2	GND	GND
3	FORWARD	Forward wave output of SWR detector

## Jumpers

The J1 jumper is used to adjusting LCD backlight led current depending on LCD 1602 module model.

To increase the LCD backlight led current, solder the J1 PCB jumper.

**NOTICE.** You should use an open J1 jumper state for the most popular LCD1602 models.

LNA POWER



J3

ANTENNA RELAY



J4

VOLUME



J2

J2 description

Jumper position	Description
<div>1 2 3</div> 1-2-3 open	Minimum sound volume
<div>1 2 3</div> 1-2 closed	Medium sound volume
<div>1 2 3</div> 2-3 closed	Maximum sound volume

J3 description

Jumper positon	Description
<div>1 2 3</div> 1-2 closed	Power supply (+12V) is used as LNA power source
<div>1 2 3</div> 2-3 closed	External power supply connected to SEQ_LNA_IN pin (X2.2) is used as LNA power source

**J4 description**

Jumper position	Description
<div data-bbox="204 412 261 562"> <div>1</div> <div>2</div> <div>3</div> </div> <div data-bbox="272 472 411 501">1-2 closed</div>	Normally closed relay output is used to switch GND to SEQ_ANT output
<div data-bbox="204 598 261 748"> <div>1</div> <div>2</div> <div>3</div> </div> <div data-bbox="272 658 411 687">2-3 closed</div>	<div data-bbox="549 591 1382 665">Normally open relay output is used to switch GND to SEQ_ANT output.</div> <div data-bbox="549 710 943 739">This is default jumper position.</div>

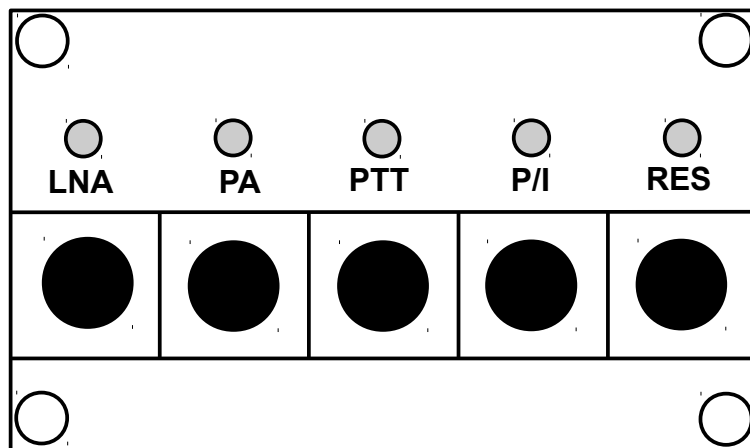
**CAUTION.** To get a correct led indication on the keyboard unit, you must use a normally open relay output.



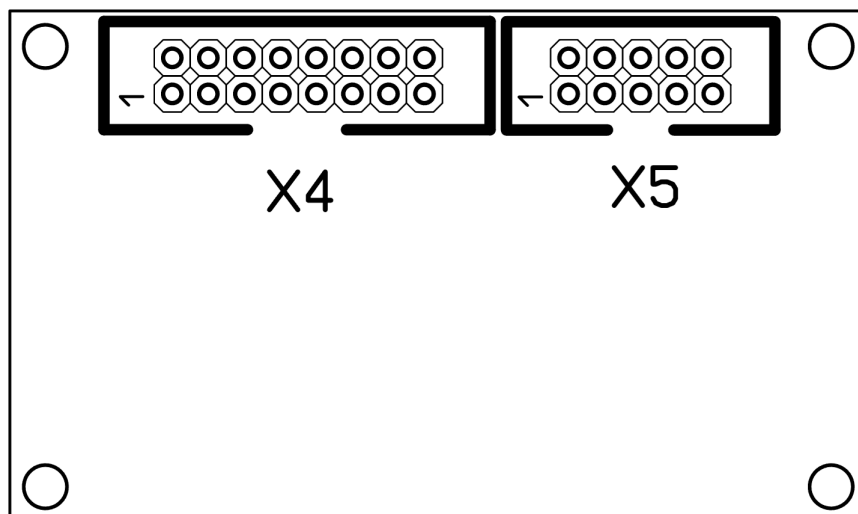
## KEYBOARD UNIT

You can connect the keys and leds to main unit by yourself or use a keyboard unit.

The keyboard unit has a 5 buttons and 5 leds above each button.



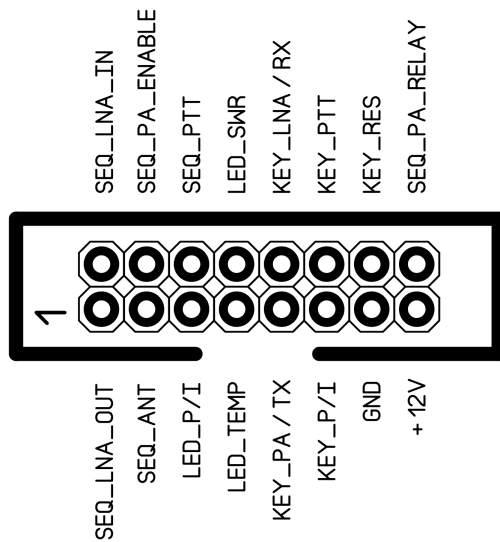
Keyboard unit has a two BH type male connectors at the back side.



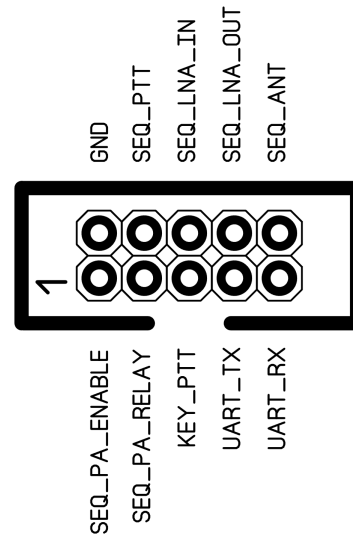
Keyboard unit connectors

The X4 male connector is used to connect to the main unit using a flexible wires crimped with IDC female connectors.

The X5 male connector is used to connect the sequencer terminals, footswitch and UART interface connectors.



X4



X5

#### X4 connector pin description

Pin	Symbol	Description
1	SEQ_LNA_OUT	Wired to the SEQ_LNA_OUT pin of X5
2	SEQ_LNA_IN	Wired to the SEQ_LNA_IN pin of X5
3	SEQ_ANT	Wired to the SEQ_ANT pin of X5 and to the LNA led cathode
4	SEQ_PA_ENABLE	Wired to the SEQ_PA_ENABLE pin of X5 and to the PA led cathode
5	LED_P/I	Wired to the P/I led cathode
6	SEQ_PTT	Wired to the SEQ_PTT pin of X5 and to the PTT key
7	LED_TEMP	Wired to the TEMP led cathode
8	LED_SWR	Wired to the SWR led cathode
9	KEY_PA / TX	Wired to the UART_TX pin of X5 and to the PA key
10	KEY_LNA / RX	Wired to the UART_RX pin of X5 and to the LNA key
11	KEY_P/I	Wired to the P/I key
12	KEY_PTT	Wired to the KEY_PTT pin of X5 and to the PTT key
13	GND	GND
14	KEY_RES	Wired to the RES key
15	+ 12V	+12V DC input
16	SEQ_PA_RELAY	Wired to the SEQ_PA_RELAY pin of X5

**X5 connector pin description**

Pin	Symbol	Description
1	SEQ_PA_ENABLE	PA enable (switches to GND)
2	GND	GND
3	SEQ_PA_RELAY	PA bypass relay (switches to GND)
4	SEQ_PTT	Transceiver PTT-in (switches to GND)
5	KEY_PTT	Footswitch or PC interface
6	SEQ_LNA_IN	LNA power / Antenna relay power source (connects to an external power source)
7	UART_TX	UART transmitter output (TX)
8	SEQ_LNA_OUT	LNA power / Antenna relay power
9	UART_RX	UART receiver input (RX)
10	SEQ_ANT	LNA bypass relay / Antenna relay (switches to GND)

If your antenna relay switches by GND source signal, use the SEQ\_ANT sequencer output.  
 If your antenna relay switches when LNA powers on, use the SEQ\_LNA\_OUT sequencer output.

**KEYS**







Each key has one or more functions depending to the device operation mode.

**Keys description**

Key	Operation mode	Function
LNA	RX	Enable / disable LNA bypass
PA	RX	Enable / disable PA bypass
PTT	RX, Calibration	Going to TX mode
P/I	RX	Switches the displayed value (PA output power / PA current consumption)
RES	RX, TX, Calibration	Enable / disable sound
RES	Locked by protection	Reset the protection lock state
P/I	Calibration	Swap the SWR meter inputs (displayed as <>)
LNA	Power on	Display the device information
PA	Power on	Activate calibration mode
RES	Power on	Disable protection
P/I + RES	Power on	Activate PC connection mode (boot mode)

## LEDS

### Leds description

Led	State	Description
LNA PA PTT	● / 	Indicates the sequencer outputs state
P/I	● (dark)	Power value displaying in the TX mode
	 (lights on)	Current consumption value displaying in the TX mode or SWR-meter inputs are swapped in the Calibration mode
RES	● ↔  (blinks in blue color)	Temperature warning level exceed
	● ↔  (blinks in red color)	SWR warning level exceed
	 (lights in blue color)	Temperature protection occurred
	 (lights in red color)	SWR protection occurred

## OPERATION MODES

The device can operate in one of these modes:

- RX;
- TX;
- Calibration;
- PC connection (Boot).

### RX

In the RX operation mode the device displays sequencer bypass settings, sound enable state, fan control stage and PA temperature.



```
RX  LNA PA  P  🎵  
FAN:0          T 32C
```

Symbol	Description
RX	RX mode
LNA	LNA enabled (LNA bypass disabled)
PA	PA enabled (PA bypass disabled)
P or I	Displayed value in TX mode (P – power, I – current)
🎵	Sound enabled
FAN	Fan operation mode (FAN0 – FAN7)
T	Temperature of PA in Celsius degrees (suffix C) or Fahrenheit degrees (suffix F)

Device takes temperature from DS18B20 sensor in Celsius degrees. Temperature in the Fahrenheit degrees are converted and rounded from the Celsius degrees value. To change the temperature degree scale use the PC software utility.

### TX

In the TX operation mode the device displays selected value (PA output power or PA current consumption) with scale, SWR value and PA temperature.

```

P= 176W   SWR=1.1
||||||| | T 32C

```

```

I= 9.2A   SWR=1.1
||||||| | T 32C

```

Symbol	Description
P	Output power value: passing power (suffix 'W') or effective power (suffix 'w')
I	PA current consumption value
SWR	SWR value
T	Temperature of PA in Celsius degrees (suffix 'C') or Fahrenheit degrees (suffix 'F')

When PA bypass mode is activated, device does not have displaying power (or current consumption) value, SWR value and scale in the TX mode.

```

TX  LNA      I  🎵
FAN:0      T 32C

```

## FAN CONTROL

Device supports up to 8 fan control stages (FAN0 – FAN7). For each stage PWM value and temperature activation value are stored in the non-volatile memory. The FAN0 stage is corresponds to zero PWM value (fan is switched off).

In the RX operation mode, the fan control uses the PWM value correspond to the current fan stage. For example, for FAN1 stage will be used the FAN1 PWM value etc.

In the TX operating mode, the fan control uses the PWM value correspond to the fan stage shifted up to 'Shift on TX' value. By default, fan control uses the PWM value of the next fan stage ('Shift on TX value' equals 1). For example, for FAN1 stage will be used the FAN2 PWM value etc. For FAN6 and FAN7 stage will be used the FAN7 PWM value.

If the temperature is lower than 'Fan start temperature' setting, fan will be shut down (FAN0 stage activated).

Fan control function implement the hysteresis on temperature down.

All of the fan control settings can be changed by the PC software utility.

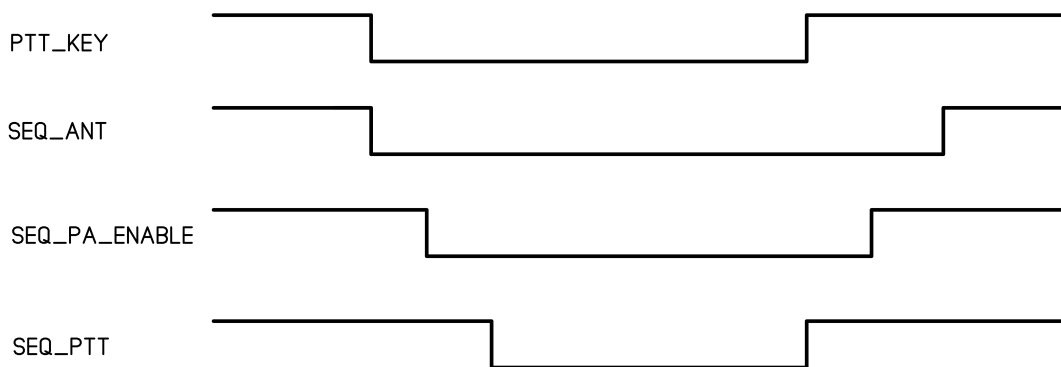
## SEQUENCER

Built-in digital sequencer has four outputs that switches to GND (three by electronic keys and one by relay). The fifth output is used to connect the LNA power source to LNA.

SEQ\_ANT sequencer output is switches to GND by relay. By default, the normally open relay output is used (2-3 of J5 are closed). You can change the behavior of SEQ\_ANT sequencer output by J5 jumper position.

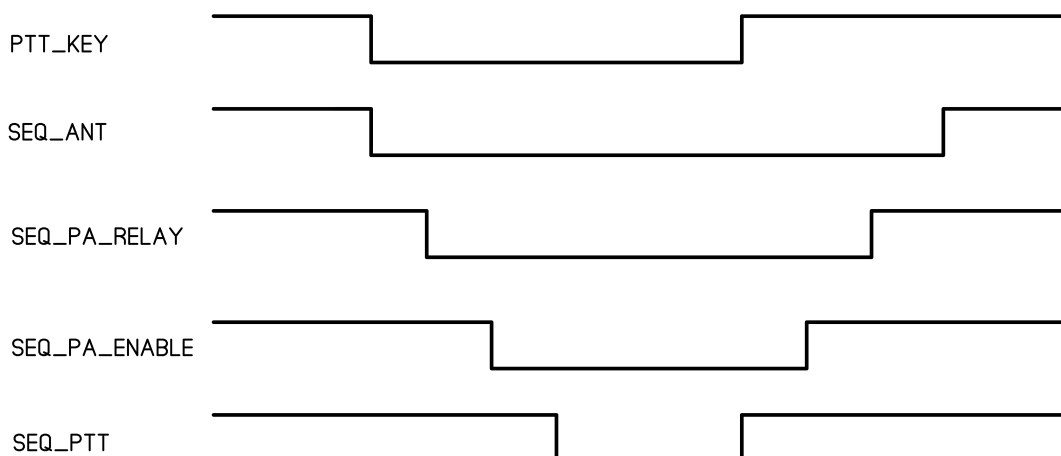
You can adjust sequencer switching delay between 20ms and 1000ms with step of 20ms using the PC software utility.

The default sequencer operation consists of three events. SEQ\_PA\_ENABLE sequencer output does not used.



Sequencer switching diagram

If your PA require separated control of bypass relay and enable state, you need to use additional 'PA Relay' sequencer stage. To enable 'PA Relay' sequencer stage use the PC software utility.



Sequencer switching diagram with using of 'PA Relay' stage

Sequencer has LNA and PA bypass modes which can be used together.

If the LNA bypass mode is enabled, the SEQ\_ANT output is switched to GND and LNA power supply is switched off. To switch the LNA bypass mode press the LNA button in the RX mode.

If the PA bypass mode is activated, the sequencer does not switch SEQ\_PA\_RELAY and SEQ\_PA\_ENABLE outputs to GND when operated. To switch the PA bypass mode press the PA button in the RX mode.

Bypass settings are displaying at the top line of the screen in the RX mode. When bypass mode is enabled, the correspond text label is not displaying on the screen.

On bypass settings change, the new settings are stored to non-volatile memory. Stored bypass settings are applied on power on.

## WARNING ALARM

Device implement two warning alarm levels. When the SWR or temperature value exceed the warning level threshold, the corresponding alarm signal is activated.

Level	Alarm
1	Flashing led and audio signal* each 4 seconds
2	Flashing led and audio signal* each 1 second

\* if sound is enabled

You can set the warning alarm thresholds by using PC software utility.

## PROTECTION

When temperature value or SWR value exceeds corresponding protection threshold value, device is going to protection state. The device TX mode is locking until the protection will not be reset.

Protection threshold values can be set by using PC Software utility.

On temperature protection, sequencer switches to RX state. Protection reason and current temperature value are displayed on the screen. Temperature alarm led lights on.





PROTECTION  
Temperature: 81C

When temperature is down to the “Temperature warning 2” setting, protection state will be reset automatically.

On SWR protection occurred, sequencer immediately switches down the SEQ\_PTT, SEQ\_PA\_ENABLE, SEQ\_PA\_RELAY outputs and going to RX mode. Protection reason and SWR value will be displayed on the screen. SWR alarm led light will be turn on.




PROTECTION  
SWR: 2.5

Any attempt to switches to the TX mode without protection reset will results into a continuous sound signal.

You can reset the protection state by pressing RES button.

To disable the protection hold the RES key on power on the device. Protection disable will be active till power down.

When protection is disabled, the “” icon displayed at top of the screen.



RX LNA PA P   
FAN:0 T 32C

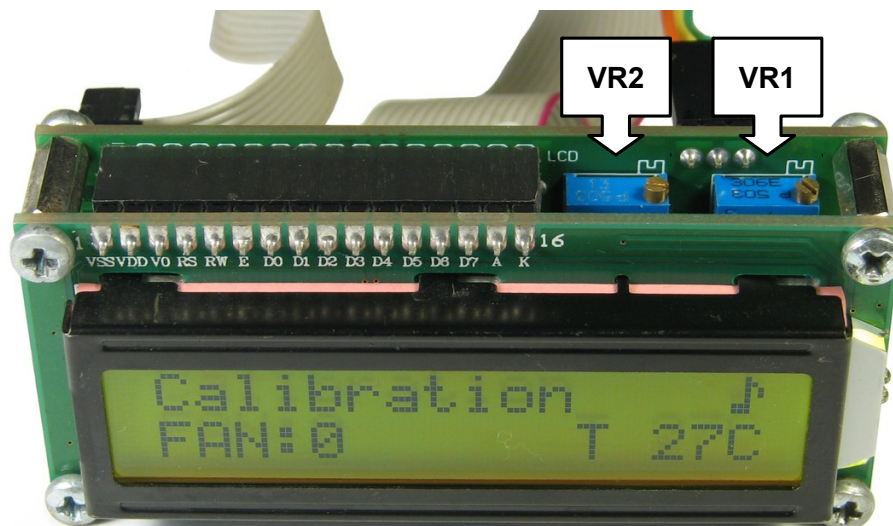
**WARNING.** Operation with disabled protection function may cause to malfunction of your PA. Use it only if necessary and on your own risk.

## CALIBRATION

Calibration mode activated by holding the PA button on power on. Calibration mode will be active till power down. You can use protection disable function when using calibration mode. To disable protection and run the calibration mode hold the PA and RES buttons simultaneously on power on the device.

### Calibrating with power meter and SWR meter

1. Switch to TX
2. Using the power meter, set the correct power value on the device screen by adjusting the VR2 resistance.
3. Using the SWR meter, set the correct SWR value on the device screen by adjusting the VR1 resistance.



### Calibrating with power meter only

In the case of using a directional coupler SWR sensor, it is possible to calibrate the SWR-meter have only a power meter by using swap of the SWR inputs (SWR-meter reflected wave line is calibrating like SWR-meter forward wave line).

1. Switch to TX.
2. Adjust the VR1 resistance to take a correct power value on the device screen.
3. Switch to RX.
4. Push the P/I button to swap the device SWR meter inputs by firmware. When the inputs are swapped, symbol "<>" will be displayed on the screen.



5. Swap the SWR detector output lines connected to the main unit. SWR detector forward wave output must be connected to SWR meter reverse input (REVERSE pin of X3 connector). SWR detector reverse wave output must be connected to SWR meter forward input (FORWARD pin of X3 connector).

6. Switch to TX.

7. Adjust the VR2 resistance to take a correct power value on the device screen.

8. Switch to RX.

9. Push P/I button to disable SWR meter inputs swapping.

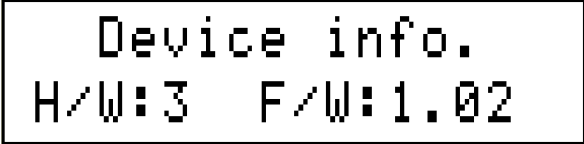
10. Connect the SWR detector correctly. SWR detector forward wave output must be connected to SWR meter forward input. SWR detector reverse wave output must be connected to SWR meter reverse input.

In the calibration mode always displayed the passing power value without subtraction of the reflection losses.

Sequencer bypass settings are not applied in the calibration mode. Sequencer bypass modes control is not available in the calibration mode.

## DEVICE INFORMATION

To get the hardware revision and software version of the device without connecting to PC, hold the LNA button on device power on.



```
Device info.  
H/W:3   F/W:1.02
```

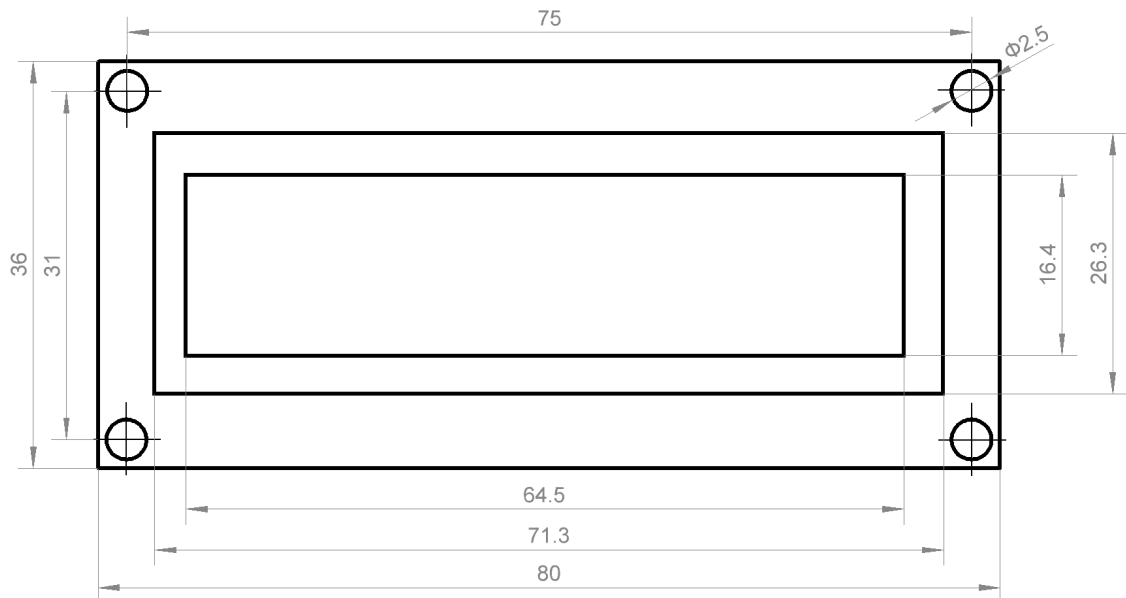
## TROUBLESHOOTING

Trouble	Reason	Solution
Cannot switch to the current consumption measure mode	1. Current sensor module is not connected.  2. Current value has a negative polarity.  3. Incorrect current sensor module connection.  4. ACS712 current module malfunction.	1. Connect the ACS712 current module to the device.  2. Swap the wires in the terminals for current being sampled.  3. Check the ACS712 module connection according to "X1 connector pin description" table.  4. Replace the current module with new one.
<div>I=ERROR SWR=1.0 T 39C</div>	1. Current value has a negative polarity.  2. Current module sensor has power supply lower than 5V DC	1. Swap the wires in the terminals for current being sampled.  2. Check the current module sensor power supply voltage and fix the problem if necessary.
SWR protection occurred with "ERR" SWR value  <div>PROTECTION SWR: ERR</div>	1. Wrong SWR sensor connection (reverse wave detectors output voltage is more than forward wave detectors output voltage).	1. Swap the SWR sensor output wires.
SWR value is "ERR" in the protection disable mode operation  <div>P= 0W SWR=ERR T 39C</div>	1. Wrong SWR sensor connection.	1. Swap the SWR sensor output wires.

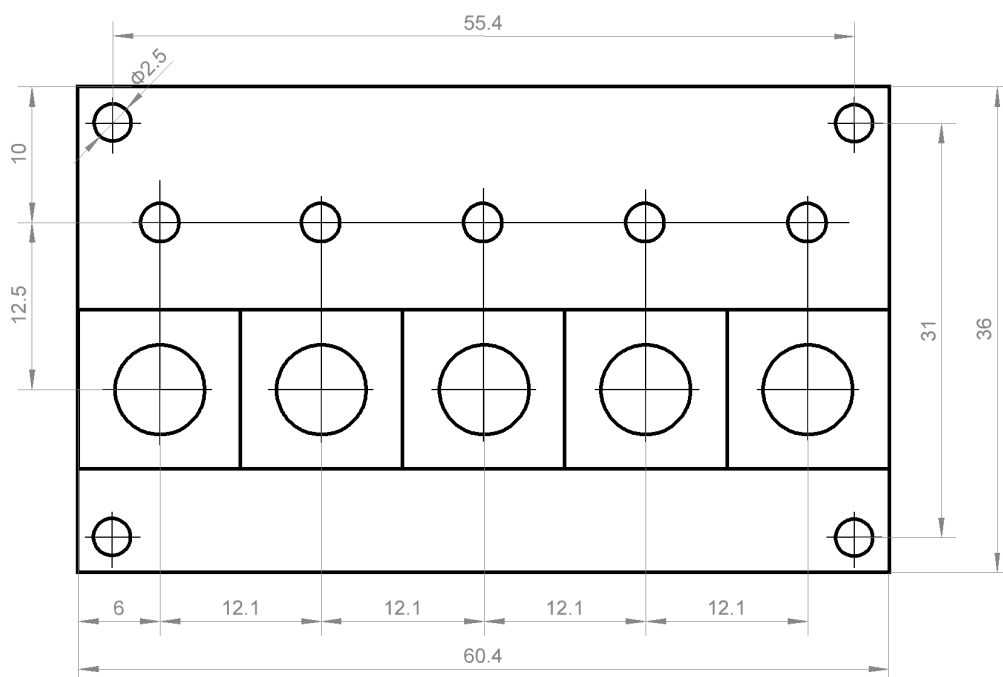
Trouble	Reason	Solution
<p>Temperature value is "N/A"</p> <pre> RX  LNA PA  P  ♪ FAN:3      T  N/A </pre>	<ol style="list-style-type: none"> <li>1. DS18B20 sensor is not connected or connection is incorrect.</li> <li>2. DS18B20 sensor "DQ" pin is shorted to 5V DC.</li> <li>3. DS18B20 sensor malfunction.</li> <li>4. Electromagnetic interference.</li> </ol>	<ol style="list-style-type: none"> <li>1. Connect the DS18B20 sensor to the main unit.</li> <li>2. Remove the DS18B20 "DQ" pin short to 5V DC.</li> <li>3. Replace the DS18B20 sensor.</li> <li>4. Use a shielded cable for DS18B20 sensor connection.</li> </ol>
<p>Displayed temperature is always 0°C (32°F)</p> <pre> RX  LNA PA  P  ♪ FAN:0      T  0C </pre>	<ol style="list-style-type: none"> <li>1. DS18B20 sensor "DQ" pin is shorted to GND.</li> <li>2. DS18B20 sensor malfunction.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove the DS18B20 "DQ" pin short to GND.</li> <li>2. Replace the DS18B20 sensor.</li> </ol>

## DIMENSIONS

The main board of main unit has the same dimensions as LCD 16x2. The main board fixed with the LCD by a screwed spacer sleeves (TFM-M2.5X12).



LCD16x2 dimensions



Keyboard unit dimensions

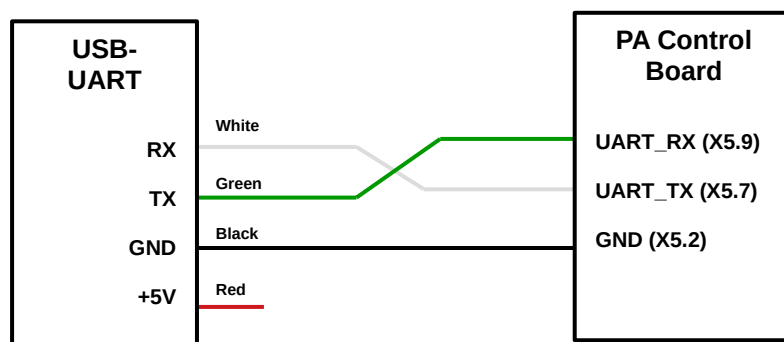
## CONNECTION TO PC

To change the device settings, you have to connect the device to PC and use the PA Control Board Utility software.

The best way to connect the PA Control Board to PC is using the data cable with integrated USB–UART converter.



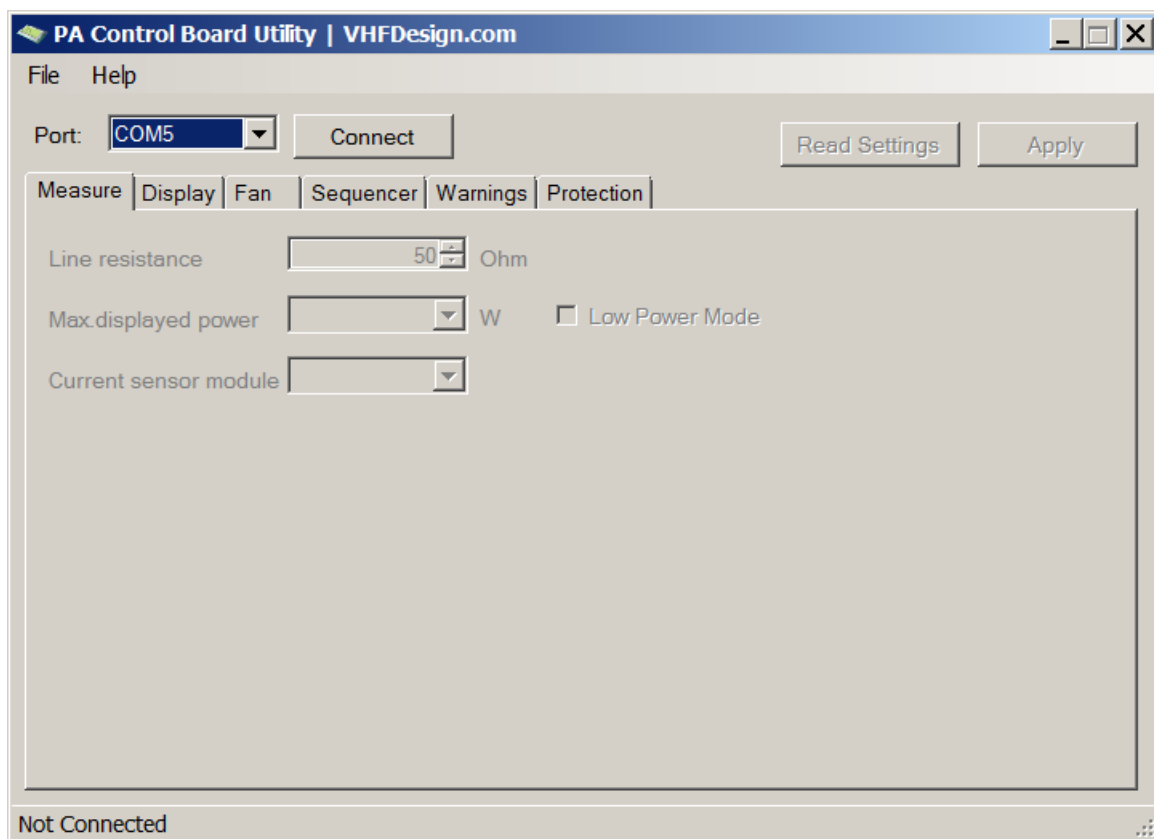
1. Turn off the device power.
2. Connect the RX data cable wire (usually white color wire) to X5.7 (UART\_TX) connector's pin.
3. Connect the TX data cable wire (usually green color wire) to X5.9 (UART\_RX) connector's pin.
4. Connect the GND data cable wire (usually black color wire) to PA Control Board GND.



5. Plug-in the USB-UART converter into USB port of your PC.
6. Make sure that USB-UART converter drivers are installed and virtual COM port are present in the device manager when converter is plugged into USB port.



7. Start the device in Boot-mode (hold the P/I and RES keys simultaneously on power on). When the device is running in Boot mode, the screen is blank and both protection leds lights on (RES led lights in magenta color on keyboard unit).
8. Download the latest version of PA Control Board software utility and run it. To run the PA Control Board Utility you must have the .Net Framework 2.0 or higher installed on your PC.
9. Select the virtual COM port of your USB-UART converter in the port combo box. To update the port list click on the port combo box.



10. Click on the 'Connect' button to connect to the device. On successful connection, the tabs will be unlocked and status bar will display the information about connected device.

**WARNING.** Do not press the LNA or PA button during connection to PC. The LNA and PA keys are physically wired to the UART data lines. Using of this keys during connection to PC may cause to a data corruption.

If something goes wrong you will see an error message.

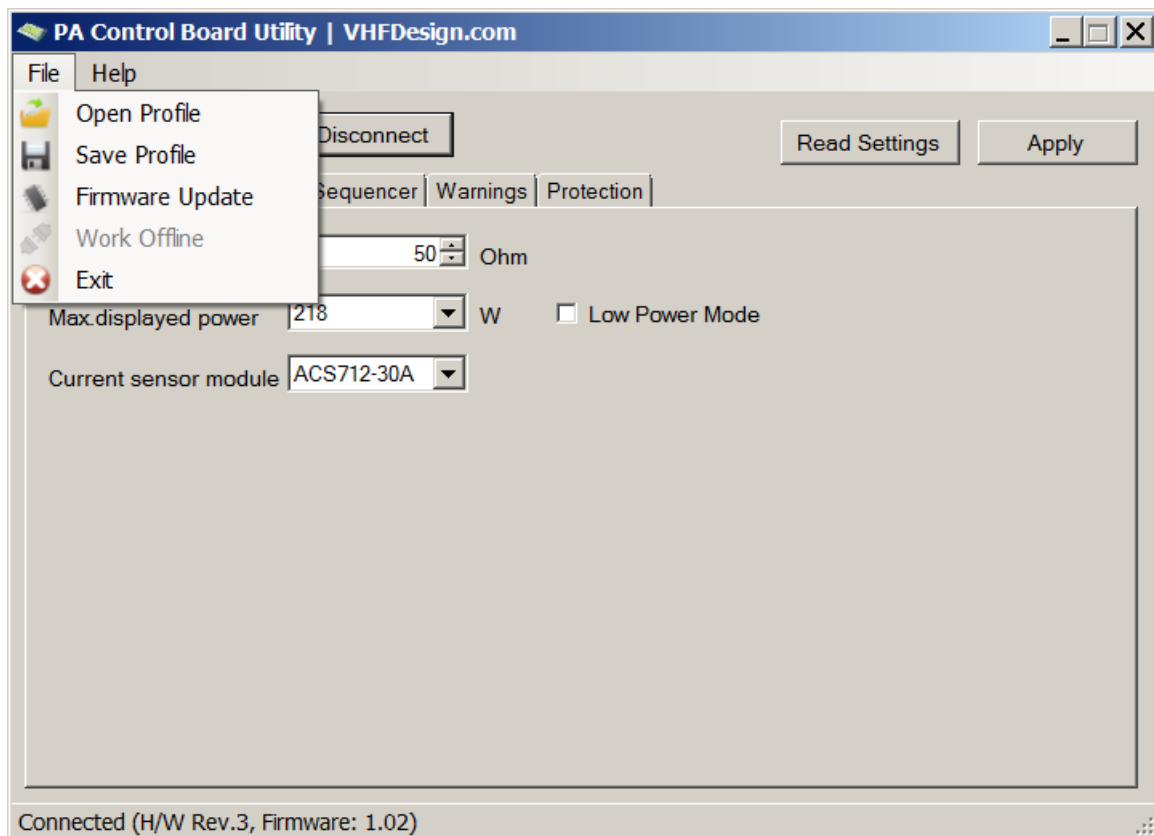


If you see the 'PA Control Board not found' error message try to do next steps to fix it.

- A.** Check that device is in boot mode.
- B.** Check correctness of device connection to PC. Maybe the USB-UART converter has other color wires assignment. Try to open the converter case and match the wires color with the silkscreen prints on PCB.
- C.** Check that selected COM port corresponds to USB-UART converter virtual COM port.
- D.** Turn off the device. Start the device in Boot mode and try to connect again.

When connection is established, utility automatically reads the settings from the device and display it on the tabs.

**CAUTION.** Before making any changes to the device settings or updating the firmware it is recommended to save the current settings to a file. Use the '**File** → **Save Profile**' menu item to save the current settings.



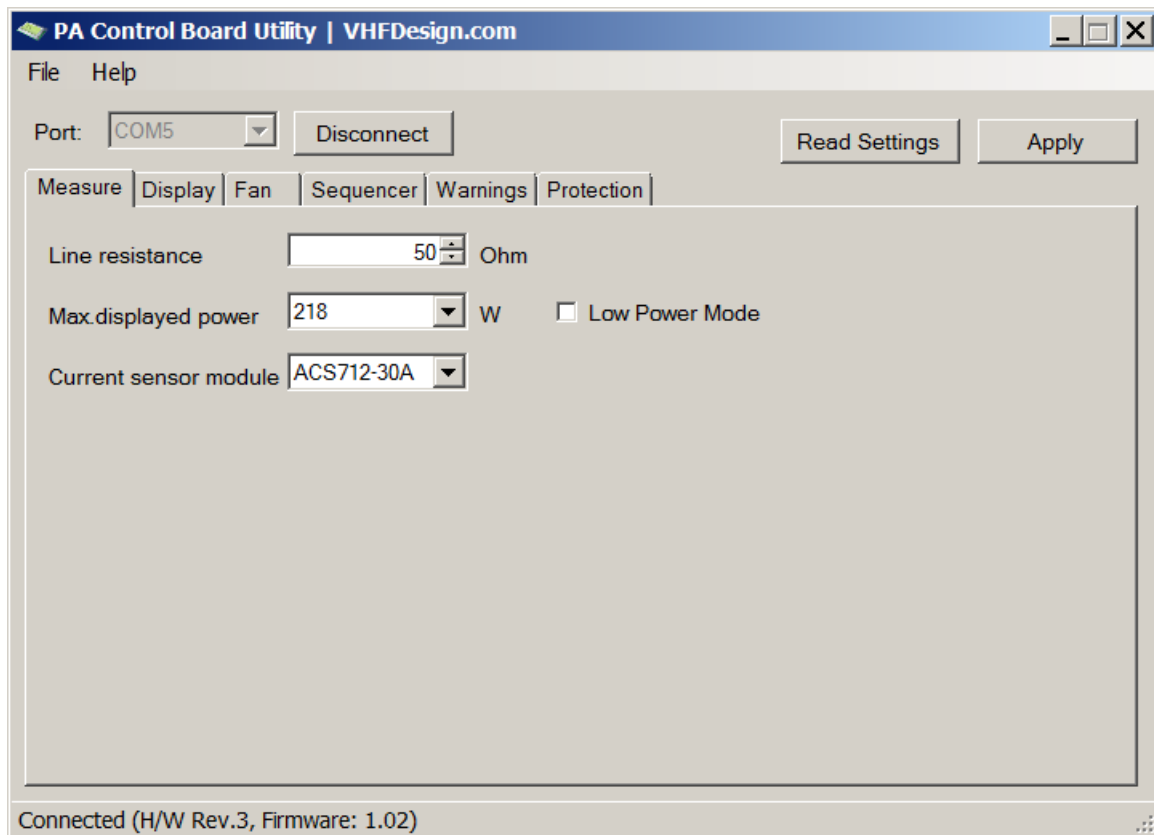
To read the settings from the device again, click on '**Read Settings**' button. Device settings will replace values on the tabs and all previous setting changes will be lost.

To save the setting changes to the device non-volatile memory, click on '**Apply**' button.

Offline mode is allow to open, save and edit profiles without connecting device to PC. To enable the offline mode, click on the '**File** → **Work offline**' menu item.

**NOTICE.** After settings changes was made don't forget to click on '**Apply**' button to save the new settings to the device non-volatile memory.

## Measure tab

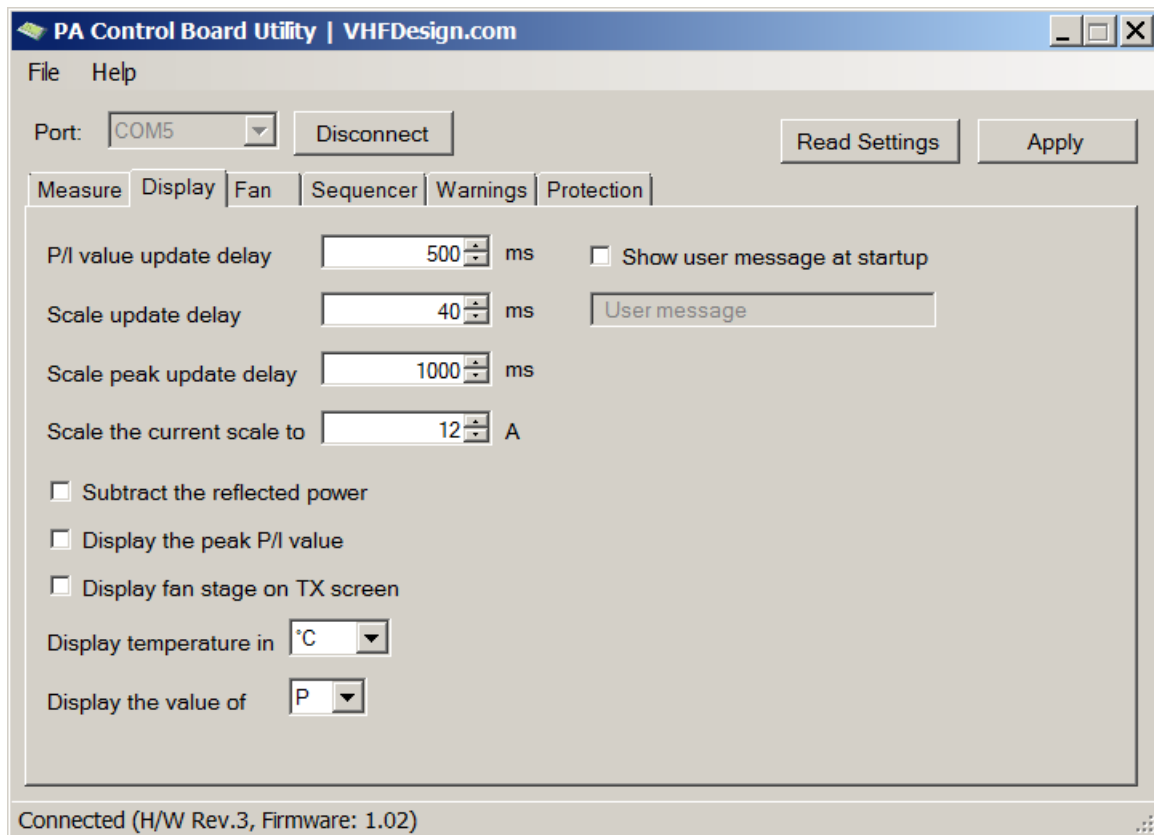


You can set the line impedance of 50 Ohm or 75 Ohm value in the '**Line resistance**' setting value.

'**Max. displayed power**' setting must be set to nearest larger value of your PA maximum output power. If you use the PA with low output power, you can set the '**Low Power Mode**' checkbox to decrease '**Max. displayed power**' in 10 times.

Select used current sensor module in the '**Current sensor module**' combo box.

## Display tab



**‘P/I value update delay’** setting is used to set the minimum delay time of updating the numerical value of power or current on the screen. Don't set the very low value of setting because high frequency of the update the displayed value is leads to difficult reading the value from display.

**‘Scale update delay’** setting is used to set the minimum delay time of updating the graphical scale on the screen.

**‘Scale peak update delay’** setting is used to set the minimum delay time of updating the peak of graphical scale since last peak changed.

**‘Scale the current scale to’** setting is used to scale the graphical scale of current to value lower than current sensor module maximum measurement value. On using BTS50085 current sensor, this setting sets up the maximum sensor current value.

For example. You use the ACS712-30A current module with 30A maximum measurement current and the PA with 5A maximum current consumption. If you set the **‘Scale the current scale to’** setting value to 30A, the graphical scale will be filled only for 16,7% at the PA maximum current consumption of 5A. To take a full filling the graphical scale at maximum PA current of 5A, you have to set the setting to 5A value.

If you set the '**Subtract the reflected power**' checkbox, the effective power value will be displayed in the TX operation mode. Effective power means power with subtraction the reflection losses from the passing power.

If you set the '**Display the peak P/I value**' checkbox, the power (or current) value correspond to the graphical scale peak will be displayed in the TX operation mode.

If you want to see fan stage on TX screen, set the '**Display fan stage on TX screen**' checkbox.

You can choose which temperature degree system will be used to display the PA temperature on the device screen by select the necessary temperature degree system in the '**Display temperature in**' combo box.

To set the custom message at device startup, set the '**Show the user message at startup**' checkbox and enter the message at the box below.

## Fan tab

Measure	Display	Fan	Sequencer	Warnings	Protection
Fan stage count	3	Shift on TX	1		
Fan start temperature	30	Hysteresis	0		
FAN1 Temperature	40	FAN1 PWM	127		
FAN2 Temperature	45	FAN2 PWM	190		
FAN3 Temperature	50	FAN3 PWM	255		
FAN4 Temperature	51	FAN4 PWM	255		
FAN5 Temperature	52	FAN5 PWM	255		
FAN6 Temperature	53	FAN6 PWM	255		
FAN7 Temperature	54	FAN7 PWM	255		

Connected (H/W Rev.3, Firmware: 1.02)

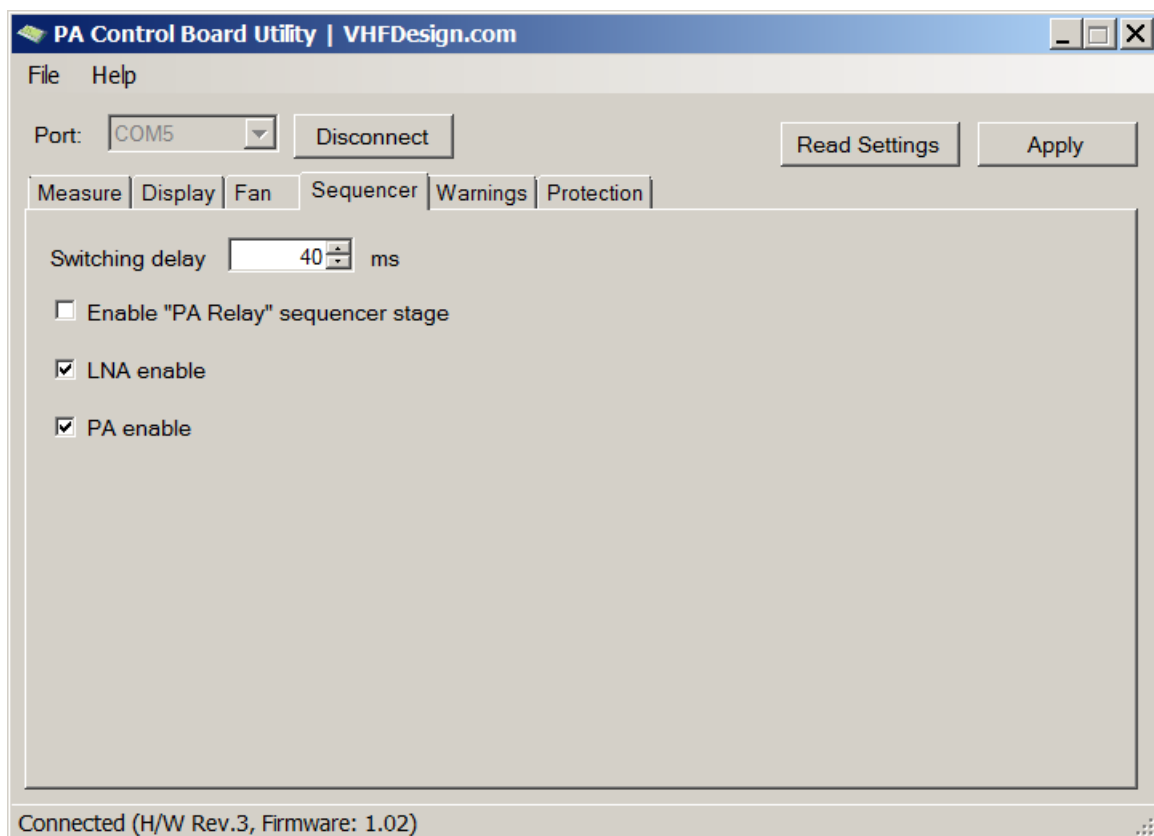
'**Fan stage count**' setting is used to set the used fan stages amount. If zero amount is set, the fan control function will be using only FAN0 stage (fan is switched off).

**'Fan start temperature'** setting is used to set the temperature value threshold to start the fan control function operate. If the temperature value is lower than **'Fan start temperature'** setting value, fan will be shut down (FAN0 stage activated) even if the fan stage activation threshold is exceeded.

You can set the hysteresis on temperature down by set the **'Hysteresis'** value setting.

Set up the temperature threshold value and PWM value for each fan stage. The temperature value is sets in Celsius degree. The PWM value must be set between 0 (0% pulse width, fan is shut down) and 255 (100% pulse width, fan is operating on full speed).

### Sequencer tab



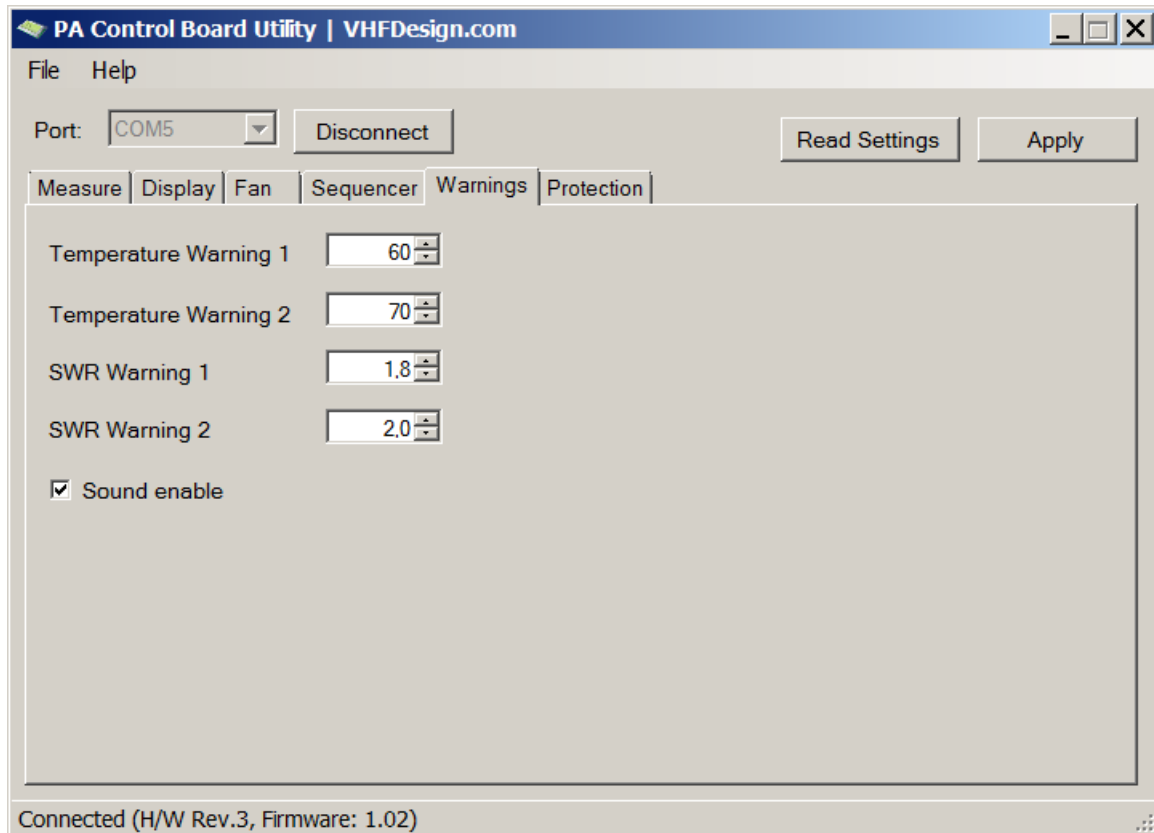
**'Switching delay'** setting is used to set the sequencer switching delay time.

To enable PA Relay sequencer stage, set the **'Enable 'PA Relay' sequencer stage'** checkbox.

**'LNA enable'** checkbox is used to control the LNA bypass mode. You can change LNA bypass mode by clicking on checkbox or pushing the LNA button in the RX operation mode.

'**PA enable**' checkbox is used to control the PA bypass mode. You can change PA bypass mode by clicking on checkbox or pushing the PA button in the RX operation mode.

## Warnings tab



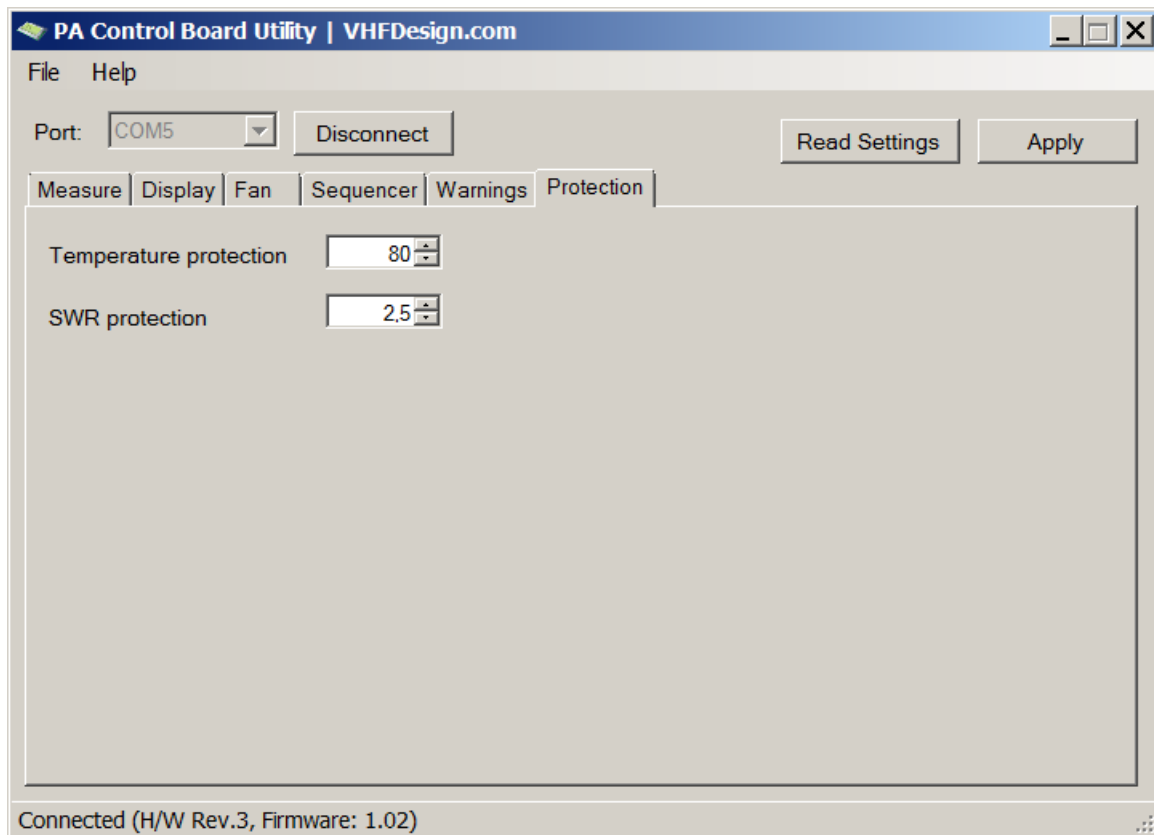
At this tab you can set the warning threshold level of temperature and SWR.

The temperature warning threshold values is set in Celsius degree.

'**Sound enable**' checkbox is used to control the sound enabled state. You can change it by clicking on the checkbox or pushing the RES button in the RX or TX operation mode.



## Protection tab



At this tab you can set the protection threshold level of temperature and SWR.

The temperature protection threshold level setting is sets in Celsius degree.

## Profiles management

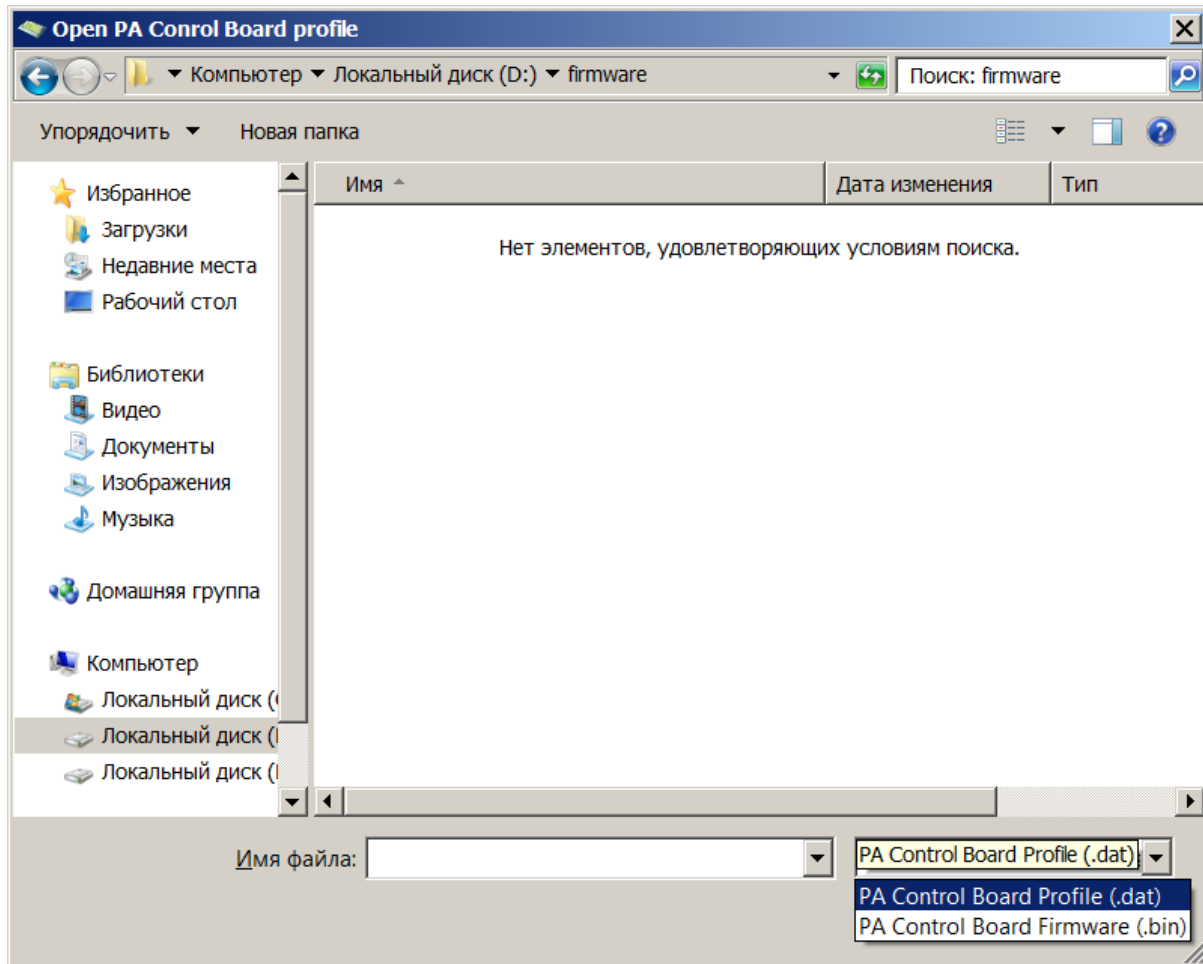
Profile is the set of device settings stored to a file.

You can load the profile from file and save it to the device non-volatile memory or you can save the device settings to a file.

To open the stored profile click on the '**File** → **Open profile**' menu item. Specify the profile file (\*.dat) in the dialog box. Profile settings will replace the current settings on the tabs.

Firmware file (\*.bin) also contain a default profile. To open this profile, select the 'PA Control Board Firmware' file type in the file type combo box of the dialog box.

To save the settings to a file click on the '**File** → **Save profile**' menu item. Set the path and profile filename in the dialog box.



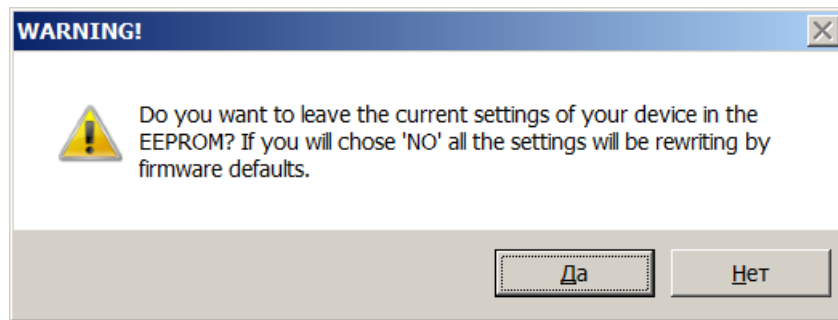
To open, save or edit profile without device connecting, use an offline mode ('**File** → **Work offline**'). To cancel the offline operational mode, click on the '**File** → **Work offline**' menu item again.

## Firmware updating

To update the device firmware:

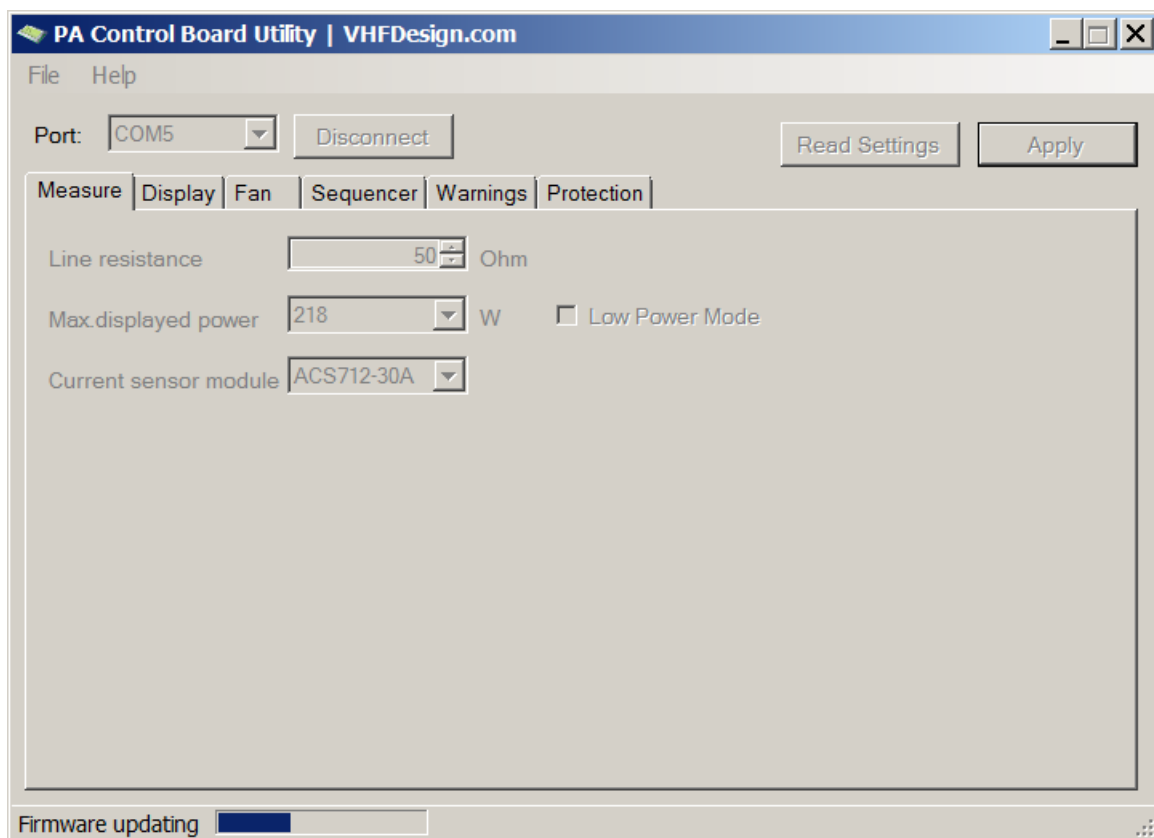
1. Click on the '**File** → **Firmware update**' menu item.
2. Specify the firmware file (\*.bin) in the file dialog box.
3. Choose whether you want to leave current device settings or not

The firmware file contains a default settings profile inside. By default, the best way is to leave the existing settings by answer '**YES**' on dialog box. If you choose 'NO', all device settings will be overwritten with stored in firmware file settings.



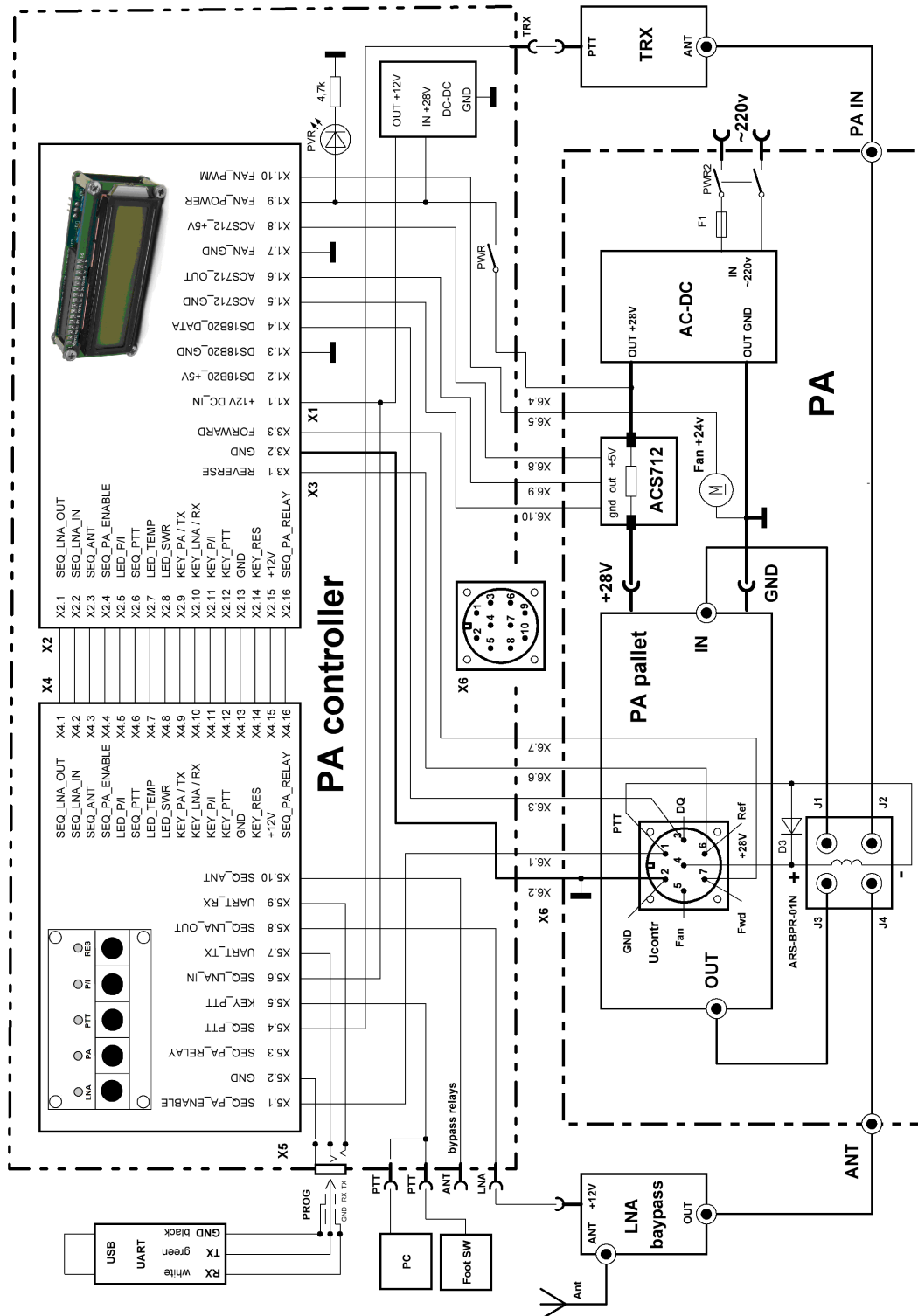
You can save the current device settings to file before firmware updating. To do it, click on the '**File** → **Save profile**' menu item.

4. Firmware updating process is displayed at status bar.



While firmware updating is in progress it is forbidden to push any buttons or power off the device.

If the firmware update process was interrupted, turn off the device and close up the utility software, then start the utility software and start the device in the Boot mode and try to update the firmware again.



# MAIN UNIT CIRCUIT DIAGRAM

